

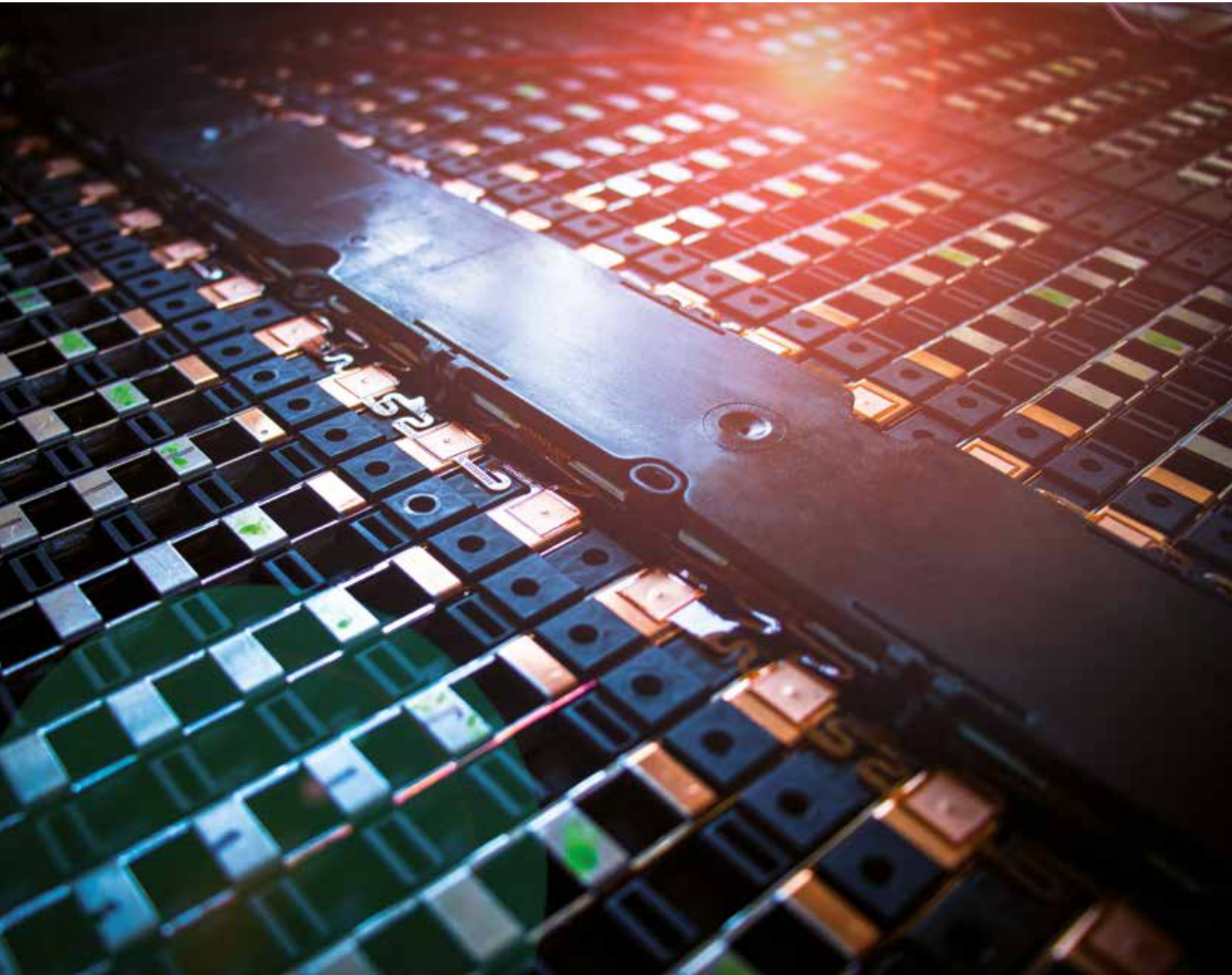
# EV, HEV and PHEV batteries

Driving mobility with innovative and sustainable surface finishing solutions

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Electronics & General Metal Finishing

atotech.com



# Leading surface-finishing solutions for EV, HEV and PHEV batteries

Lithium-ion batteries power electric and hybrid vehicles while simultaneously reducing automobile carbon dioxide emissions. A primary goal of new battery technologies is to obtain higher-density energy storage coupled with innovations in battery design that requires advances in surface treatment techniques.

Battery manufacturers strive to achieve an effective range for electric vehicles that is comparable to internal combustion engine automobiles. Innovative battery developments focus on new, active materials or thinner current collector foils that require novel, viable manufacturing processes and surface treatment methods.

We offer perfectly matched processes for every step of surface finishing application; from pretreatment to final sealing.

## Battery cell

- Cathode and anode current collector
- Connectors and busbars
- Lead tabs

## Battery module

- Battery housing and fasteners
- Electromagnetic shielding
- Battery and cell management
- Liquid cooling



# Cathode and anode current collectors

Advanced battery technology, especially high-capacity active materials on current collectors, requires adhesion improvement through adjusted adhesion promoters. Atotech offers adhesion promotion solutions ranging from tailor-made molecules, to adhesion promotion processes, to application expertise for the best manufacturing results. Our range of copper and aluminum foil treatments improves adhesion to resins and polyimide.



## Copper plating for thin and low stress foils and adhesion promotion

Thinner copper foils, which are characterized by lower stress, more even surfaces and new material combinations for manufacturing current collectors, facilitate weight reduction. Copper plating on top of alternative materials also promotes enhanced conductivity, while surface treatment of the deposited copper layers improves adhesion and corrosion protection. We offer the complete process for copper plating on various base materials, as well as copper surface treatment for corrosion resistance and adhesion promotion.

**CuFoilPET:** High-speed copper plating process with good ductility and low internal stress resulting in low warpage

**Argalin® XL:** Sustainable, Cr(VI)-free, water-based solution operating at high speed in high current densities with short exposition times

**Superdip Cu 1000:** Organic component-based dip solution, adjustable to short exposition times for high throughputs



## Pretreatment and electroless nickel processes for aluminum foil plating and adhesion promoters

A wide variety of aluminum alloys require specific treatment chemistry for proper surface preparation that facilitate excellent adhesion and defect-free coatings. We provide a complete portfolio of state-of-the-art pretreatment and electroless nickel solutions. Our electroless nickel processes are designed to plate on all types of aluminum alloys for perfect adhesion, high corrosion and wear resistance.

**Uniclean® 151:** Non-etch soak cleaner with high cleaning power and contamination retention

**Uniclean® 1020:** Alkaline etch with high metal sequestration for longer lifetimes

**AlumEtch® LF:** Desmut for a wide range of aluminum alloys and with NOx suppression

**AlumSeal® 611:** Zincate for Al designed to produce very thin zinc coating and reduce drag-in of zinc into the electroless nickel bath

**Nichem® family:** Full range of electroless nickel (low-P, mid-P, and high-P) processes tailored for various applications, providing excellent corrosion protection, electrical conductivity and wear resistance

**Interlox®:** Zirconium-based passivates for aluminum alloys, providing enhanced corrosion protection

# Connectors and busbars

Connectors and busbars transmit high current loads and resist attrition caused by constant motion during system operation. It is therefore essential that they are highly conductive and wear resistant. As the leading supplier of nickel silver and nickel tin plating processes, as well as anti-tarnishes for connectors and busbars, we offer complete processes from pretreatment to nickel barrier and subsequent hard silver plating to Cr(III) based layers for protection. We additionally offer processes from pretreatment, to nickel barrier and subsequent MSA based pure tin plating, to heat and humidity resisting anti-tarnishes.



## Nickel, silver and tin plating

Powertrain connectors require low contact and high wear resistance. A stack of hard silver layers on top of nickel deposits provides both of these qualities, and Atotech product portfolio utilizes this optimal combination.

Moreover, tin is an increasingly attractive alternative to expensive precious metal coatings for busbars. Atotech Stannopure® PF 10 is a completely green and sustainable solution that doesn't sacrifice effectiveness.

**Ni Sulfamate:** High-speed pure nickel deposition process

**Novoplate® HS:** High-speed corrosion-resistant nickel-phosphorous coating (> 12%)

**Argalux® NC:** Cyanide-free hard-silver plating process (130 HV)

**Silvertech® RBH:** Cyanide-based hard silver-plating process (180 HV)

**Silvertech® C:** Silver-graphite plating process for improved wear resistance

**Stannopure® PF 10:** Green high-speed tin plating process



## Pretreatment and anti-tarnishes

Pre- and post-treatment are crucial to achieving appropriate surface treatments on metal finishes. The most important and often overlooked step is post-treatment, which ensures long-lasting surface properties of the final finishes. We have the right anti-tarnish for every surface.

**SuperDip Cu 1000:** Surface cleaning processes for aluminum and its alloys

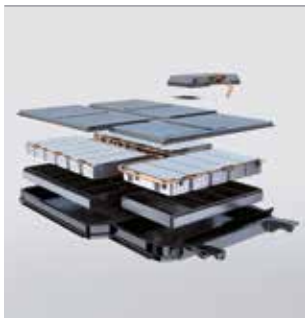
**Puronon®:** High-speed cleaning pretreatment for copper and copper alloys

**Argalin® XL:** Chromium-based anti-tarnish, ROHS compatible (CrIII) for silver, copper, and nickel

**Protectostan®:** Product family to protect tin from heat or humidity exposure

# Battery housing and fasteners

Battery housings manufactured from aluminum or steel require protection against corrosion to ensure the longevity of the components. Subsequent coatings, both electrolytic and electroless conversion coatings, best adhere to clean surfaces. We offer a full range of sustainable cleaners, surface preparation, and corrosion protective coatings for the battery enclosure/housing, module cover, cooling tray and other metallic components within the battery system. Steel battery housing components are best protected against corrosion with our highly efficient electrolytic-based coatings, which provide unmatched corrosion resistance. With Atotech electrolytic and zinc flake-based coatings, fasteners and fixings for battery assembly meet the high demands for reduced contact corrosion, improved conductivity, and defined coefficients of friction.



## Sustainable solutions for battery housings

The pretreatment of the aluminum battery housing ensures superior adhesion of paint and a high level of corrosion resistance. When defects arise in the paint, the housing must undergo complete paint removal to eliminate the risk of in-field failures.

**UniPrep®:** Long life, low-temperature degreasers suitable for steel and aluminum battery components

**Interlox®:** Zirconium-based conversion coatings and passivates for enhanced corrosion protection and paint adhesion

**Master Remover®:** Sustainable paint removal process ideal for part reclamation and rack and fixture cleaning

The electrolytic plating of steel battery housing results in high-performance corrosion protection. An appropriate passivate will ensure perfect adhesion to subsequent paint or fire retardant.

**Zinni® + Reflectalloy®:** Acid and alkaline zinc nickel electrolytes for highest corrosion protection requirements

**EcoTri® NC, EcoTri® HC 2, Tridur® DB:** Passivates to enhance corrosion protection and adhesion to subsequent coatings

**Sealer 350 WL8, Sealer 300 W 2.0:** Organic and inorganic transparent sealers providing superior appearance and corrosion performance



## Battery housing fasteners

For brackets, fixtures, and fasteners that fix joints at the contact of metal- and nonmetal material mix, Atotech electrolytic zinc, zinc nickel, and Hiron® processes, together with the appropriate post-treatment of passivates, sealers, and top coats, provide high corrosion protection, stable and specific clamping forces, and improved contact corrosion.

**Zinni® 220 + EcoTri® NC + Zintek® Top XT:** System with stainless steel appeal, passing 120 cycles of ASTM G85 A5 cyclic corrosion test

**Zinni® AL 450 + EcoTri® HC 2 + Techseal® Clear:** System for achieving the lowest possible contact corrosion

**Hiron® + EcoTri® NC + Sealer 350 WL8:** Nickel- and cobalt-free system for high corrosion protection with adjusted coefficient of friction properties

# Liquid cooling

In liquid-cooled heat sinks, the risk of metallic components to corrode as they age constitutes a major challenge for liquid cooling systems. To address this concern, we provide medium and high phosphorus electroless nickel processes that deliver exceptionally high corrosion resistance to the intricately shaped components exposed to the chemical environment of coolants, ensuring that the plates maintain their integrity and functionality over time, safeguarding the overall performance and lifespan of the battery system.



## Chemical and corrosion resistant coatings

**Nichem® MP NF:** Medium-phosphorus electroless nickel process (5 – 8% P)

**Nichem® HP 1170:** Provides highest corrosion protection in acidic conditions available

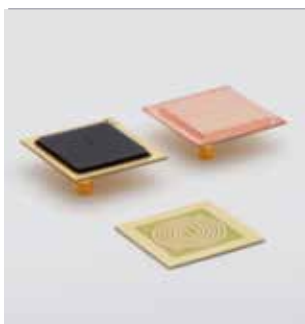
**Nichem® HP 1151:** Produces non-magnetic, highly corrosion resistant and pit-free deposits

**EDEN® 115:** Operates with the EDEN® technology that provides >500 MTO bath life with consistent deposit quality, reducing nickel waste by up to 35%

**Niflor® HP 118:** Advanced electroless nickel PTFE composite process for highly hydrophobic surfaces with PTFE co-deposition ranging between 20 – 30% by volume

# Electromagnetic shielding

Modern cars are equipped with features for both convenience and safety. All of these emit and may be affected by electromagnetic radiation-based interference. Electric vehicles also include additional sources such as power converters, electric motors, traction batteries, or chargers. When a power source and victim are placed near each other, electromagnetic interference between them must be safeguarded with shielding.



## Conductive and soft magnetic electroplated layers

For a wide range of applications, we offer pre-treatments to plate directly onto molding resins for components, PCBs, or highly engineered plastic housings to protect the electronics systems. With our portfolio of highly-conductive and soft magnetic electroplated layers, we support high shielding effectiveness for low-frequency electromagnetic radiation.

**Covertron® 600:** Cr-free and non-PFAS polymer pretreatment like ABS, ABS/PC, and engineering plastics such as PP, PEI, or PEEK

**Cupracid® UP:** Advanced copper intermediate layer solution between nickel strike or immersion copper layer and top electromagnetic shielding nickel-iron layer offering excellent stress balance between metal and plastic

**NiFe Shield:** High nickel-containing alloy, ideal for three-dimensional parts providing uniform thickness distribution on the surface, increasing resistivity and improving magnetic properties

# Lead tabs

Lithium battery pouches must be perfectly sealed to prevent the formation or emergence of hydrofluoric acid. The insulation material must therefore firmly adhere to the anode lead tab. We offer the complete coating process, from pretreatment to nickel processes for barrier layer or conductive layer plating to the adhesion promoting and corrosion-resistant trivalent chromium-based top layer for improved adhesion between the insulation and lead tab.



## Lead tab adhesion

Corrosion can decrease adhesion properties, leading to separation and swelling. The improved corrosion protection of our products prevents the formation of hydrofluoric acid within the battery pouch pack. For adhesion in lead tab manufacturing, we offer following processes:

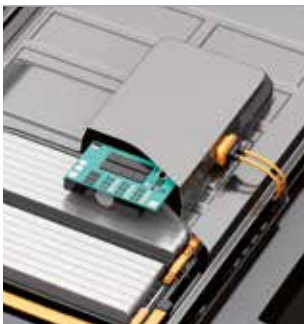
**NovoPlate® HS:** High-speed corrosion resistance nickel-phosphorous coating (> 12% P)

**Argalin® XL:** RoHS compatible Cr(III)-based adhesion promoter for improved reliability

**Interlox®:** Zirconium-based aluminum passivation for enhanced adhesion and corrosion protection

# Battery and cell management

As an integral part of the battery, the battery management system must be highly durable, reliable, and productive. The electronic package must withstand higher temperatures and high humidity over extended periods to improve its lifetime. Automotive requirements for the whole IC package have thus become more and more stringent, adding extra heat exposure tests on top of moisture sensitivity level (MSL) testings.



## Lead frame IC packages and Printed Circuit Boards

We have developed specific reliability boosters such as adhesion promoters that can overcome package delamination issues under heat and humidity as well as solder joint improvement processes that are specifically designed for QFN packages.

**MoldPrep™:** Adhesion promoter between copper and mold material to improve MSL test level and survive heat treatment

**AgPrep™:** Non etching adhesion promoter for silver plated lead frames and mold material to improve MSL test level and survive heat treatment

**PpfPrep™:** Non etching adhesion promoter for pre plated lead frames with mold material to improve MSL test level and survive heat treatment

**Stannatech®:** Product family for highly reliable immersion tin deposits

**Stanna-Q®:** Immersion tin process specifically designed to form 3D solder joints on QFN wettable flanks

# MKS offers a full range of sustainable functional and decorative surface treatments



## Battery competency

Reliable, high-quality processes for metallic and plastic substrates exceeding industry standards.



## Global presence

Sales and service for our Atotech products in more than 40 countries enable us to provide efficient customer support worldwide. Many of our products are approved by numerous OEMs worldwide.



## Best local service

Our unique global TechCenter network allows us to offer an unmatched spectrum of services, from pilot production, chemical and materials science investigations to comprehensive training for customers and business partners.



## Leading technologies

We collaborate heavily with the entire value chain to seek new paths and set benchmarks for the development of innovative surface finishing processes.



## Production know-how

We provide customers with complete factory design concepts. Our production systems guarantee the highest level of quality and efficiency in wastewater treatment solutions, all at a reduced cost.



## Sustainable solutions

We use less hazardous chemicals whenever possible, eliminate wastewater to the greatest extent possible, as well as reduce our carbon footprint.

